MODULAR ELECTRONIC BUILDING SYSTEMS WITH MAGNETIC INTERCONNECTIONS AND METHODS OF USING THE SAME

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 13/593,891, entitled "Modular Electronic Building Systems with Magnetic Interconnections and Methods of Using the Same," filed Aug. 24, 2012 (now U.S. Pat. No. 9,019,718), which claims priority to and the benefit of U.S. Provisional Patent Application No. 61/527,860, filed Aug. 26, 2011, each of the disclosures of which is incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

The present invention relates to the field of electronics and, more particularly, to electronic building blocks and toy building sets.

BACKGROUND

Currently, people spend many hours a day with technological devices, but most don't know how they work, or how to make their own. For all the interactivity of these devices, people are bound to passive consumption. Furthermore, playing, creating, or integrating electronics into projects, toys and products is intimidating, time consuming, requires an expert skill set, as well as specialized hardware/software platforms. People are afraid to connect electronic objects the wrong way, or to electrocute themselves. This makes building objects with lights, sounds, buttons and other electronic components very difficult and prohibitive to kids, young students, designers, non-engineers, and others lacking necessary experience. But as advances in the miniaturization of technology increase, electronics need to become more accessible to non-experts in a cost effective manner.

It becomes therefore clear that there is an opportunity and need to create a simple, easy to use, accessible electronic building block platform that can still enable the creation of complex, interdependent systems. Such a platform would enhance learning, enable 21st century experimentation and promote innovation. Also, what is needed is a system that acts like an additional material in the creative process and allows children and adults to combine and incorporate the system or its parts with other traditional materials such as paper, cardboard and screws.

The following references provide background information and are hereby incorporated by reference in their entirety: Ayah Bdeir, (2009), Electronics as material: littleBits, In *Proceedings of the 3rd International Conference on Tangible and Embedded Interaction* (TEI '09), ACM, New York, N.Y., USA, 397-400, DOI=10.1145/1517664.1517743, at http://doi.acm.org/10.1145/1517664.1517743; and Ayah Bdeir and Ted Ullrich, (2010), Electronics as material: littleBits, In *Proceedings of the fifth international conference on Tangible, embedded, and embodied interaction* (TEI '11), ACM, New York, N.Y., USA, 341-344, DOI=10.1145/1935701.1935781, at http://doi.acm.org/10.1145/1935701.1935781.

SUMMARY

In some exemplary aspects, an electronic educational toy or building system is provided that teaches the logic of programming and circuit building without requiring expertise in either. The modular block building system consists of pre-assembled printed circuit boards (PCB) interconnected by small magnets. Each block performs one or more discrete functions (e.g., an LED, a pushbutton, a light sensor with a threshold, etc.), and the blocks can be combined to create larger circuits. Some blocks respond to external events such as mechanical forces, touch, proximity, radio frequency signals, environmental conditions, etc. Other blocks are pre-programmed such as synthesizers, oscillators, etc. Still other blocks simply pass current like wire blocks. Yet other blocks provide current such as power blocks/modules.

In some aspects, the system includes modules having many different manners of interaction between the modules. The interaction between modules, not the modules themselves, may form the building blocks of the creative platform. In previous electronic kits the electronic component may be at the center of the manipulation: resistors, capacitors, batteries, etc. By manipulating the modules in those kits, children learn how electricity flows, how to design a circuit, or how to identify components. This knowledge, however, is application specific and features only a single circuit. It has little or no bearing on how the touch sensitive wheel of an iPod™ works, for example, or how a nightlight works, or how a cell phone vibrates, or how a phone can detect rotation and automatically rotate images on the screen in response to that rotation, or how to make one's own objects that have that interactivity. While we are a society obsessed with increasingly complex electronic devices (such as, for example, DVD players, MP3 players, cell phones, smoke alarms), the current learning tools on the market only teach the very basics of electronics and electricity, such as allowing us to turn on a light or see current flow. There is a widening gap between what is taught to the average American and what is both used and consumed by that American. This is also why most electronic kits and toys are very short-lived in that the kits and toys are not relevant to user's day-to-day life. To date, there is no way for children or adults to be able to create their own interactive objects with custom-designed interactive behavior, without having to program or learn the many complexities involved with advanced electronics. With the present modular system, people will be able to program interactivity intuitively and in a tangible way.

The description and drawings herein are meant as an illustration of one or more exemplary embodiments of the invention, but should not be considered limiting or restrictive. As such, there are a number of manners of modification without departing from the spirit and scope of the invention. In the following text, the words block and module may be used interchangeably to signify the modular circuit boards.

The modules may be divided into categories corresponding to their function. Examples of categories include, but are not limited to: power modules, input modules, output modules, wire modules, etc. Power modules for instance take current from a battery, a wall wart, or other power source, and convert it into current feeding the other components of the system. In any working configuration of modules, there may be at least one power module. Input modules include, but are not limited to: buttons, switches, sensors, logic blocks, etc. Output modules include, but are not limited to: LEDs, displays, sound modules, etc. Wire modules do not perform a particular function, but act as wire extensions, configuration changers, and in some cases logic and state modules.

In one exemplary embodiment, standalone blocks are provided that may enable users, with little or no electronics or programming experience, to construct basic and complex sensor and interaction-based analog and digital circuits.